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Ascidians from the Coast of Kii Peninsula, Middle Japan, with Descriptions of Two New Species*

By

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西川輝昭**: 紀伊半島産ホヤ類

During the survey programme "Natural History of the Kii Peninsula" of the National Science Museum, the author was engaged in the study of the ascidians collected along the coast of Kii Peninsula, from Toshi-jima Island in Mie Prefecture in the east to Kada in Wakayama Prefecture in the west, mainly by himself (A) and partly by other researchers (B–L) in different localities on the coast. In all, 76 species, 3 taxa allied to known species, 2 subspecies, 2 varieties and 3 forms were identified, but the other 6 species remained questionable. Of these, many are new to the coast, 4 species new to Japan, and 2 new to science. The results are given in Table 1, together with the previous records by Drs. OKA and TOKIOKA.

Material for the study

A. *Collection made by the present author*

A–1: Shore of Funakoshi, Minoshima; 1–2 m deep, June 5, '77: *Amaroucium pliciferum* REDIKORZEV, *Didemnum (D.) moseleyi* (HERDMAN), *Ascidia ahodori* OKA, *Botryllus tuberatus* RITTER & FORSYTH, *Symplegma reptans* (OKA) and *Pyura vittata* (STIMPSON).

A–2: Rocky intertidal zone of Hatake-jima Island, Tanabe Bay; '73 to '79: *Amaroucium multiplicatum* (SLUITER), *A. yamazii* (TOKIOKA), *A. monotonicum* TOKIOKA, *Didemnum (D.) moseleyi* (HERDMAN), *D. (D.) candidum* SAVIGNY, *D. (D.) translucidum* TOKIOKA, *D. (Polysyncraton)* sp., *Trididemnum savignii* HERDMAN, *Diplosoma mitsukurii* (OKA), *Eudistoma rubrum* TOKIOKA, *E. tokarae* TOKIOKA, *Distaplia systematica* TOKIOKA, *Ciona intestinalis* (LINNÉ) (*sensu* HOSHINO & TOKIOKA, 1967), *C. robusta* HOSHINO & TOKIOKA, *Perophora formosana* (OKA), *P. sagamiensis* TOKIOKA, *Ascidia zara* OKA, *A. ahodori* OKA, *Botryllus magnicoecus* (HARTMEYER), *Botrylloides violaceus* OKA, *Symplegma japonica* TOKIOKA, *Polycarpa granosa* TOKIOKA, *Cnemidocarpa areolata* (HELLER), *Styela partita* (STIMPSON), *Pyura elongata* TOKIOKA, *P. lepidoderma* TOKIOKA, *Herdmania momus* (SAVIGNY) and *Microcosmus curvus* TOKIOKA.

A–3: Off the northern coast of Seto Mar. Biol. Lab., Tanabe Bay; several meters deep; '75 to '79: *Polycarpa cryptocarpa* var. *kuroboja* (OKA) and *Herdmania mirabilis* (DRASCHE).

A–4: Rocky subtidal zone off Hikigawa-cho; 0–6 m deep; during the benthos survey '73 to '79: *Pseudodistoma antinboja* TOKIOKA, *Polycitor proliferus* (OKA), *Rhopalaea crassa* (HERDMAN), *Ascidia*

* Contributions to the Japanese ascidian fauna XXXIII
Contributions from the Seto Marine Biological Laboratory, No. 665

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alpha TOKIOKA, *Symplegma japonica* TOKIOKA, *Polycarpa cryptocarpa* var. *kuroboja* (OKA), *Cnemidocarpa areolata* (HELLER), *Pyura elongata* TOKIOKA, *P. curvigona* TOKIOKA, *P. lignosa* MICHAELSEN, *Herdmania momus* (SAVIGNY), *Halocynthia hilgendorfi* f. *ritteri* (OKA) and *Microcosmus hartmeyeri* OKA.

A–5: Along the northern side of Okino-kuro-shima Islet, off Susami-cho; 3–7 m deep; Aug. 9, '78: *Polycarpa cryptocarpa* var. *kuroboja* (OKA) and *Pyura lignosa* MICHAELSEN.

A–6: Around the Sabiura Mar. Park Res. Station, Kushimoto; several meters deep; July 31 and Aug. 1, '79: *Didemnum (D.) moseleyi* (HERDMAN), *Polycitor proliferus* (OKA), *Ascidia sydneiensis samea* (OKA)*, *A. alpha* TOKIOKA, *Rhodosoma turcicum* (SAVIGNY), *Cnemidocarpa areolata* (HELLER)*, *Pyura sacciformis* (DRASCHE) and *P. lignosa* MICHAELSEN. Species with asterisk were found also in a tank of the Station.

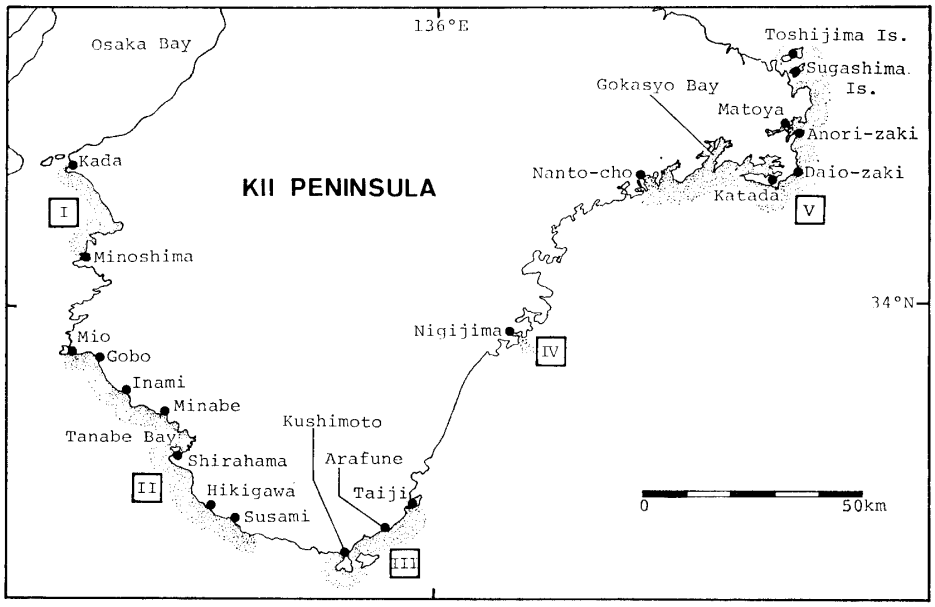

Fig. 1. Map of Kii Peninsula showing main localities classified into five districts I to V.

A–7: Shore of Arafune, Kii-tahara; July 30, '79: *Amaroucium multiplicatum* (SLUITER), *Pseudodistoma kanoko* TOKIOKA & NISHIKAWA, *Didemnum (D.) candidum* SAVIGNY, *Eudistoma tokarae* TOKIOKA, *Botryllus primigenus* OKA, *Polycarpa cryptocarpa* var. *kuroboja* (OKA), *Cnemidocarpa areolata* (HELLER) and *Pyura curvigona* TOKIOKA.

A–8: Rocky intertidal shore off Temma, Taiji-cho; Aug. 9, '78: *Polycitor proliferus* (OKA) and *Perophora formosana* (OKA).

A–9: Inlet of Nigi-jima, Mie Prefecture; several meters deep; Aug., '78 and July, '79: *Didemnum (D.) moseleyi* (HERDMAN), *Leptoclinides madara* TOKIOKA, *Diplosoma mitsukurii* (OKA), *Polycarpa cryptocarpa* var. *kuroboja* (OKA), *Cnemidocarpa areolata* (HELLER), *Pyura lignosa* MICHAELSEN, *Halocynthia hilgendorfi* f. *ritteri* (OKA) and *Microcosmus hartmeyeri* OKA.

A–10: Intertidal zone of Hoza-ura, Nanto-cho; July 27, '79: *Tridemnum savignii* HERDMAN, *Perophora formosana* (OKA), *Ascidia zara* OKA, *A. ahodori* OKA, *Styela plicata* (LESUEUR), *S. partita* (STIMPSON) and *Pyura vittata* (STIMPSON).

A–11: Near the mouth of the inlet of Oka-ura, Gokasyo Bay; 0–2 m deep; July 26, '79: *Didemnum (D.) moseleyi* (HERDMAN), *Diplosoma mitsukurii* (OKA), *Cnemidocarpa areolata* (HELLER), *Pyura vittata* (STIMPSON) and *P. lignosa* MICHAELSEN.

A–12: Inlet of Taso-guchi, Gokasyo Bay; 5–7 m deep; July 26, '79: *Eidustoma parvum* (OKA), *Polycarpa cryptocarpa* var. *kuroboja* (OKA) and *Cnemidocarpa areolata* (HELLER).

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Table 1. List of the ascidians from Kii Peninsula on previous records and the results of the present study.

	Districts around Kii Peninsula					Distribution
	I	II	III	IV	V	
POLYCLINIDAE						
1. *Polyclinum saturnium* SAVIGNY		+				b_2
2. *P. tsutsuii* TOKIOKA		+				b_2
3. *P.* sp.		+				
4. *Amaroucium pliciferum* REDIKORZEV	+					b_2
5. *A. multiplicatum* (SLUITER)		+	+		+	b_2
6. *A. yamazii* (TOKIOKA)		++(4)			+	b_1
7. *A. sagamiense* TOKIOKA					+	b_1
8. *A. glabrum* VERRILL		+				a_2
9. *A. monotonicum* TOKIOKA		++				b_1
10. *A. japonicum* TOKIOKA					(3)	b_1
**11. *A. nadaense* n. sp.		+				b_1
12. *A.* sp., aff. *nadaense*		+				
13. *Synoicum clavatum* (OKA)		+				b_2
14. *Sigillinaria* (?) sp.		+				
15. *Homoeodistoma longigona* TOKIOKA		(7)				b_1
16. *Pseudodistoma kanoko* TOKIOKA & NISHIKAWA			+			b_1
17. *P. antinboja* TOKIOKA		+(4)				b_1
DIDEMNIDAE						
18. *Didemnum* (*Didemnum*) *moseleyi* (HERDMAN)	+	++	++	++	++(4)	a_3
19. *D.* (*D.*) *candidum* SAVIGNY		+	+			b_2
20. *D.* (*D.*) *translucidum* TOKIOKA		++(8)				b_1
21. *D.* (*D.*) *grande* (HERDMAN)?		+				
22. *D.* (*D.*) *misakiense* (OKA & WILLEY)					+	b_2
*23. *D.* (*D.*) *nekozita* TOKIOKA		+				b_2
24. *D.* (*Polysyncraton*) *sagamiana* TOKIOKA		+				b_2
25. *D.* (*P.*) *aspiculatum* TOKIOKA					(3)	b_2
26. *D.* (*P.*) sp., aff. *mortenseni* MICHAELSEN		+				
27. *D.* (*P.*) sp.		+				
28. *Tridemnum savignii* (HERDMAN)		+			+	b_2
29. *Leptoclinides madara* TOKIOKA		+		+	+	b_1
30. *L. komaii* TOKIOKA					(3)	b_1
31. *Lissoclinum japonicum* TOKIOKA		(6)				b_1
32. *Echinoclinum verrilli* VAN NAME		+				b_2
33. *Diplosoma mitsukurii* (OKA)		++(4)		+	+(3)	b_2

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Table 1. (Cont.)

	Districts around Kii Peninsula					Distribution
	I	II	III	IV	V	
POLYCITORIDAE						
34. *Clavelina viola* TOKIOKA & NISHIKAWA		+				b_1
35. *C. elegans* (OKA)		(15)				b_1
36. *C. coerulea* (OKA)					(15)	b_1
37. *Eudistoma parvum* (OKA)		+			+	b_2
38. *E. rubrum* TOKIOKA		+				b_2
39. *E. tokarae* TOKIOKA		+	+			b_2
40. *Polycitor proliferus* (OKA)		+	+			b_2
**41. *Polycitorella setoensis* n. sp.		+				b_1
42. *P.* sp.		+				
43. *Distaplia dubia* (OKA)		+				a_1
44. *D. systematica* TOKIOKA		+ + (6)				b_1
45. *Sycozoa kanzasi* (OKA)		+				b_1
CIONIDAE						
46. *Rhopalaea crassa* (HERDMAN)		+				b_2
47. *Syndiazona grandis* OKA		+ (4)(7)	+			b_1
48. *S. chinensis* TOKIOKA		+				b_2
49. *Ciona intestinalis* (LINNÉ) (*sensu* HOSHINO & TOKIOKA, 1967)		+			+	a_1
50. *C. robusta* HOSHINO & TOKIOKA		+				a_1
ASCIDIIDAE						
51. *Perophora formosana* (OKA)		+ +	+ +		+	b_2
52. *P. sagamiensis* TOKIOKA		+				b_1
53. *Ascidia sydneiensis samea* (OKA)		+	+ (13)		+	a_3
54. *A. sydneiensis divisa* (SLUITER)					+	a_3
55. *A. zara* OKA		+ + (5)			+	a_1
56. *A. alpha* TOKIOKA		+	+		+	b_1
57. *A. ahodori* OKA	+	+			+	b_1
58. *A. matoya* TOKIOKA					(4)	b_1
59. *A. citrina* NISHIKAWA & TOKIOKA			(13)			b_1
AGNESIIDAE						
60. *Agnesia himeboja* OKA		+			(3)	a_1
CORELLIDAE						
61. *Rhodosoma turcicum* (SAVIGNY)			+ (3)		+	b_2
62. *Corella japonica* HERDMAN					+	a_3
BOTRYLLIDAE						
63. *Botryllus primigenus* OKA		+	+			a_3
64. *B. tuberatus* RITTER & FORSYTH	+	+			+	a_3
65. *B. schlosseri* (PALLAS)		+				a_3

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Table 1. (Cont.)

	Districts around Kii Peninsula					Distribution
	I	II	III	IV	V	
66. *Botryllus magnicoecus* (HARTMEYER)		+				b_2
67. *Botrylloides violaceus* (OKA)#2		+			+(3)#3	a_3
68. *B. violaceus tenuicoecus* TOKIOKA		(12)				b_1
69. *B. violaceus marginatus* TOKIOKA		(11)				b_1
70. *B. viride* TOKIOKA		(9)				b_1
STYELLIDAE						
71. *Symplegma reptans* (OKA)	+	+(4)			+	b_1
72. *S. japonica* TOKIOKA		++				b_1
73. *S. connectens* TOKIOKA					(4)	b_1
74. *Polyzoa vesiculiphora* TOKIOKA		+			+	a_1
75. *Polyandrocarpa* (*Eusynstyela*) *misakiensis* W. & T.			+			b_1
76. *Polycarpa cryptocarpa* var. *kuroboja* (OKA)		++(5)	+(13)	++	++	b_1
77. *P. pedata* HERDMAN		+(6)	+			b_2
78. *P. maculata* HARTMEYER		+				b_2
79. *P. doederleini* var. *siranuhi* TOKIOKA		+				b_1
80. *P. granosa* TOKIOKA		+				b_1
81. *P.* sp., aff. *tinctor* (QUOY & GAIMARD)		+				
82. *Cnemidocarpa areolata* (HELLER)		++	+	++	++	b_2
83. *C. miyadii* TOKIOKA					(3)	b_1
84. *Styela plicata* (LESUEUR)		++			+	c
85. *S. plicata* f. *tenuis* TOKIOKA	+					b_1
86. *S. partita* (STIMPSON)		++(14)			+	b_2
87. *S. clava* HAERDMAN	(10)				+	a#4
88. *S. longipedata* TOKIOKA		+				b_1
89. *S. esther* HARTMEYER			(13)			a_1
90. *Metandrocarpa uedai* WATANABE & TOKIOKA?		+				
PYURIDAE						
91. *Pyura vittata* (STIMPSON)	+	+(5)			+(2)(4)	a_3
*92. *P. elongata* TOKIOKA		+				b_2
93. *P. sacciformis* (DRASCHE)		+(4)	+		+(3)(4)	a_1
94. *P. lepidoderma* TOKIOKA		+			(3)	b_2
95. *P. curvigona* TOKIOKA		+	+			b_2
96. *P. lignosa* MICHAELSEN		+	+	+	+	b_2
97. *P. shiinoi* TOKIOKA					(4)	b_1
98. *Herdmania momus* (SAVIGNY)		++(4)	++(13)		++	b_2
99. *H. mirabilis* (DRASCHE)	+					a#5

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Table 1. (Cont.)

		Districts around Kii Peninsula					Distribution
		I	II	III	IV	V	
100.	*Halocynthia hilgendorfi* f. *ritteri* OKA		+		+	+	a_1
101.	*H. simaensis* TOKIOKA					(4)	b_1
102.	*Microcosmus hartmeyeri* OKA		+	+	+	+	b_1
103.	*M. curvus* TOKIOKA		+				b_2
*104.	*M. exasperatus* HELLER		+				b_2
105.	*Boltenia echinata* f. *iburi* (OKA)		+				a_1
106.	*B. undulata* (TOKIOKA)#2					(3)	b_1
107.	*Hartmeyeria orientalis* OKA		+			(3)	b_1
*108.	*H. chinensis* TOKIOKA		+				b_2
	MOLGULIDAE						
109.	*Eugyrioides glutinans* (MÖLLER)		+			(3)	a_2
110.	*E. hexarhiza* TOKIOKA		+			(3)	b_1
111.	*Molgula hozawai* OKA		+				a_1
112.	*M. aidae* OKA					(3)	b_1
113.	*M. oligostriata* TOKIOKA					(3)	b_1
	Total	8	89	23	8	50	

+: present, ++: abundunt. *: new to Japan, **: new to science. #1: Also recorded from Osaka Bay, and Long Beach in California (NISHIKAWA, unpublished). #2: See the text. #3: Relative position of ovary to testis does not fit the position in typical *Botrylloides*. #4: Also recorded from Tonking Bay and Europian waters. #5: Recorded also from the west coast of Kii Peninsula by OKA (1) and the west coast of North America (VAN NAME, 1945). For (1) to (15) see the references and for $a_1 \sim a_3$, $b_1 \sim b_2$ and c see the text (p. 000).

A–13: Shore of Katada, Shima district; Aug. 11, '78: *Didemnum (D.) moseleyi* (HERDMAN), *Diplosoma mitsukurii* (OKA) and *Styela plicata* (LESUEUR).

A–14: Rocky shore of Daio-zaki; 1–2 m deep, July 25, '79: *Leptoclinides madara* TOKIOKA, *Polycarpa cryptocarpa* var. *kuroboja* (OKA), *Cnemidocarpa areolata* (HELLER), *Styela partita* (STIMPSON) and *Pyura vittata* (STIMPSON).

A–15: Subtidal zone around Anori-zaki; July 24, '79: *Amaroucium yamazii* (TOKIOKA), *Symplegma reptans* (OKA) and *Halocynthia hilgendorfi* f. *ritteri* (OKA).

A–16: Shore of Matoya, Matoya Bay; 1 m deep; July 23, '79: *Amaroucium multiplicatum* (SLUITER), *Didemnum (D.) moseleyi* (HERDMAN), *Botrylloides violaceus* OKA, *Styela plicata* (LESUEUR) and *S. clava* HERDMAN.

A–17: Attached to ropes hanging down to 1–3 m deep, in a cove by the Sugashima Mar. Biol. Lab., Sugashima Is., May 24, '79: *Didemnum (D.) misakiensis* (OKA & WILLEY), *Diplosoma mitsukurii* (OKA), *Ascidia sydneiensis samea* (OKA), *A. sydneieinsis divisa* (SLUITER), *A. zara* OKA, *A. alpha* TOKIOKA, *A, ahodori* OKA, *Rhodosoma turcicum* (SAVIGNY), *Botryllus tuberatus* RITTER & FORSYTH, *Polycarpa cryptocarpa* var. *kuroboja* (OKA), *Cnemidocarpa areolata* (HELLER), *Styela clava* HERDMAN, *Pyura vittata* (STIMPSON), *Herdmania momus* (SAVIGNY) and *Microcosmus hartmeyeri* OKA.

A–18: Rocky intertidal zone of Senzyo, Sugashima Is., Mar. 3, '80: *Amaroucium multiplicatum* (SLUITER), *A. sagamiense* TOKIOKA, *Tridemnum savignii* (HERDMAN), *Ascidia ahodori* OKA, *Botryllus tuberatus* RITTER & FORSYTH, *Polyzoa vesiculiphora* TOKIOKA, *Cnemidocarpa areolata* (HELLER), *Pyura vittata* (STIMPSON) and *P. sacciformis* (DRASCHE).

A–19: Intertidal zone of Choja-hama, Toshi-jima Island; May 25, '79: *Didemnum (D.) moseleyi*

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(HERDMAN), *Ascidia alpha* TOKIOKA, *Botrylloides violaceus* OKA, *Cnemidocarpa areolata* (HELLER) and *Pyura sacciformis* (DRASCHE).

B. *Collection made by Dr.* TOKIOKA *mainly from Tanabe Bay*

Polyclinum sp. (off Minabe; 100–200 m deep; Jan.—Feb., '50), *Amaroucium multiplicatum* (SLUITER) (Hatake-jima Is., Tanabe Bay; Mar. 28, '63), *Sigillinaria* (?) sp. (off Minabe; 100–200 m deep; Jan. Feb., '50), *Didemnum* (*D.*) *moseleyi* (HERDMAN) (Hatake-jima Is.; Mar. 28, '63), *D.* (*D.*) *translucidum* TOKIOKA (Seto), *Diplosoma mitsukurii* (OKA) (Hatake-jima Is.; Mar., '63), *Polycitor proliferus* (OKA) (Seto; Hatake-jima Is., Apr., '53 and Mar. 29, '60), *Polycitorella* n. sp. (T. YAMAMOTO coll.; Shiso-jima Is.; Mar. 2, '61), *Distaplia systematica* TOKIOKA (Hatake-jima Is.), *Agnesia himeboja* OKA (Tachigatani, Tanabe Bay; 10 m; Apr. 7, '40), *Botryllus primigenus* OKA (Shiso-jima Is., May 2, '61), *B. schlosseri* (PALLAS) (Hatake-jima Is.; Mar. 23, '63), *B. magnicoecus* (HARTMEYER) (Seto), *Botrylloides violaceus* OKA (Seto; Hatake-jima Is., Mar. 28, '63), *Polycarpa cryptocarpa* var. *kuroboja* (OKA) (Mio, M. TANAKA coll.; Seto; Nov. 30, '50), *P. maculata* HARTMEYER (off Minabe; 100–200 m; Feb.—Mar., '50), *Styela plicata* (LESUEUR) (Hatake-jima Is.; Mar. 28, '63), *S. plicata* f. *tenuis* TOKIOKA (Kada), *Metandrocarpa uedai* WATANABE & TOKIOKA? (the Aquarium of Seto Mar. Biol. Lab.; Feb.—Apr., '53), *Pyura vittata* (STIMPSON) (Seto), *P. sacciformis* (DRASCHE) (Mio, M. TANAKA coll.; Hatake-jima Is.; Mar. 28, '63), *P. lepidoderma* TOKIOKA (Seto), *Herdmania momus* (SAVIGNY) (Mio, M. Tanaka coll.; off Ichie, Hikigawa-cho; Apr. 28, '39), *H. mirabilis* (DRASCHE) (Hatake-jima Is.; Apr., '53), *Microcosmus exasperatus* HELLER (Seto) and *Boltenia echinata* f. *iburi* (OKA) (off Minabe; 100–200 m; Feb.—Mar., '50).

C. *Collection made by Mr.* T. YAMAMOTO *and consisting of the specimens found in the samples dredged by shrimp net off Inami (near Gobo), Sakai (Minabe), Yuzaki (Shirahama), Susami and Kushimoto,* 80–100 *m deep, and off Wagu (near Katada)*

Amaroucium glabrum VERRILL (Sakai; Jan. 25, '77), *Amaroucium* sp. (Sakai; Mar. 21, '75), *Synoicum clavatum* (OKA) (Sakai; Feb. 19, '77), *Didemnum (D.) moseleyi* (HERDMAN) (Sakai, Feb. 19, '77; Wagu, Mar. 15, '80), *D. (D.) nekozita* TOKIOKA (Inami; Apr. 18, '72), *Eudistoma parvum* (OKA) (Inami, Apr. 18, '72; Wagu, Mar. 15, '80), *Rhopalaea crassa* (HERDMAN) (Sakai; Mar. 31, '76), *Syndiazona grandis* OKA (Sakai; Jan. 15, '75; Feb., '75; Mar. 25, '76), *S. chinensis* TOKIOKA (Yuzaki; Dec. 30, '76), *Polycarpa pedata* HERDMAN (Susami, Feb., '75 and Jan. 30, '76; Kushimoto, Feb. 28, '77), *Cnemidocarpa areolata* (HELLER) (Sakai; Feb., '76; Apr. 25, '76; Feb. 19, '77 and Yuzaki; Dec. 30, '76), *Styela longipedata* TOKIOKA (Inami; Feb. 22, '76) and *Microcosmus hartmeyeri* OKA (Sakai; Jan. 18 and May 8, '75; Dec. 10, '76 and Yuzaki; Dec. 30, '76).

D. *Collection made by Mr.* T. IMAOKA *and consisting of the specimens found in the samples dredged by shrimp net off Tanabe Bay* (*30–80 *m deep*; *June* 4–5, '79 *and* **50–70 *m deep*: *Sept.* 16–17, '79) *and off Setozaki, Shirahama* (***130 *m deep; Jan.* 21, '75)

Ascidia sydneiensis samea (OKA)*, *Polycarpa cryptocarpa* var. *kuroboja* (OKA)*)**, *P. maculata* HARTMEYER*, *P. doederleini* var. *siranuhi* TOKIOKA*, *Cnemidocarpa areolata* (HELLER)*)***, *Styela plicata* (LESUEUR)*)**, *Herdmania momus* (SAVIGNY)*, *Microcosmus hartmeyeri* OKA** and *Hartmeyeria chinensis* TOKIOKA*.

E. *The specimens collected on the rocky subtidal zone, several meters deep, off Nada in the city of Gobo, during the benthos survey on May,* '78 (*see* FUSE *et al.,* 1979)

Polyclinum saturnium SAVIGNY, *P. tsutsuii* TOKIOKA, *Amaroucium multiplicatum* (SLUITER), *A. yamazii* (TOKIOKA), *Amaroucium* n. sp., *Didemnum* (*D.*) *moseleyi* (HERDMAN), *D.* (*D.*) *translucidum* TOKIOKA, *D.* (*D.*) *grande* (HERDMAN)?, *D.* (*Polysyncraton*) *sagamiana* TOKIOKA, *D.* (*P.*) sp. aff. *mortenseni* MICHAELSEN, *Tridemnum savignii* (HERDMAN), *Leptoclinides madara* TOKIOKA, *Echinoclinum verrilli* VAN NAME, *Diplosoma mitsukurii* (OKA), *Clavelina viola* TOKIOKA & NISHIKAWA, *Eudistoma tokarae* TOKIOKA, *Polycitorella* sp., *Distaplia dubia* (OKA), *Ascidia sydneiensis samea* (OKA), *Botryllus tuberatus* RITTER &

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FORSYTH, *B. magnicoecus* (HARTMEYER), *Symplegma reptans* (OKA), *Cnemidocarpa areolata* (HELLER), *Styela partita* (STIMPSON), *Herdmania momus* (SAVIGNY) and *Molgula hozawai* OKA.

F. *Specimens dredged in Tanabe Bay, 7–40 m deep, during the benthos survey '77–'78*

Tridemnum savignii (HERDMAN), *Sycozoa kanzasi* (OKA), *Ascidia ahodori* OKA, *Polycarpa* sp. aff. *tinctor* (QUOY & GAIMARD), *Styela plicata* (LESUEUR), *Pyura sacciformis* (DRASCHE), *Herdmania momus* (SAVIGNY), *Hartmeyeria chinensis* TOKIOKA and *Eugyrioides glutinans* (MÖLLER).

G. *Specimens collected along the northern shore of the Seto Mar. Biol. Lab., 3–5 m deep, in '74 to '77 by Messrs.* T. KUWAMURA, Y. YANAGISAWA, R. FUKAO, H. TANASE, H. KOYAMA, T. YAMAMOTO and *Dr.* M. IMAFUKU

Polycitor proliferus (OKA), *Botryllus schlosseri* (PALLAS), *Polycarpa cryptocarpa* var. *kuroboja* (OKA), *Cnemidocarpa areolata* (HELLER), *Styela plicata* (LESUEUR), *Pyura elongata* TOKIOKA and *Herdmania momus* (SAVIGNY).

H. *Specimens collected from the soft bottom off Gobo in Apr., '78 and presented by Dr. S.* FUSE

Polyzoa vesiculiphora TOKIOKA, *Hartmeyeria orientalis* OKA and *Eugyrioides hexarhiza* TOKIOKA.

I. *Specimens deposited at the Sugashima Mar. Biol. Lab. (data missing)*

Ciona intestinalis (LINNÉ) (*sensu* HOSHINO & TOKIOKA, 1967) and *Corella japonica* HERDMAN.

J. *Specimens deposited at the Sabiura Mar. Park Res. Station*

Syndiazona grandis OKA (no data), *Polyandrocarpa* (*Eusynstyela*) *misakiensis* WATANABE & TOKIOKA (off the Station; 15 m deep; Aug. 1, '79; H. MISAKI coll.) and *Microcosmus hartmeyeri* OKA (off Kushimoto; Oct. 31, '76; H. MISAKI coll.).

K. *Specimens collected by Mr.* R. YAMANISHI *on the rocky intertidal zone near Cape Shionomisaki, Kushimoto, June 27, '76*

Polycitor proliferus (OKA).

L. *Specimen collected by Mr.* Y. NAKAJIMA *on the intertidal zone of Tenzin-zaki, Tanabe Bay, Mar. 2, '78*

Didemnum (D.) translucidum TOKIOKA.

Descriptions of Two New Species

Amaroucium nadaense n. sp. (Fig. 2, A–C)

Description: Seven small roundish colonies collected off the shore of Nada in the city of Gobo, Wakayama Prefecture; 3 m deep; May 2, 1978 (Material E). The colony designated as holotype (SMBL Type No. 326) is 6.0 mm × 11.5 mm in extent and 4.0 mm in thickness, and the largest colony of the specimens designated as paratype (NSMT–Pc 101) is 14.0 mm × 9.0 mm in extent and 5.0 mm in thickness. Colony impregnated densely and evenly with sand grains; surface nearly smooth. System indistinct.

Thorax colored orange, up to 2 mm long; abdomen nearly as long as thorax; postabdomen variable in length, usually longer than abdomen. Branchial aperture 6-lobed and terminal;

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atrial one at the level of 3rd or 4th stigmatal row and with smooth margin; atrial languet with simple or rarely bifid tip and issued from the middle between dorsal ganglion and atrial aperture. About twenty longitudinal muscles on each side of thorax. About eight stigmata in each half of 13 to 15 (usually 14) stigmata rows. Dorsal languets along the left side of the mid-dorsal line. Tentacles ca. a dozen. Ciliated groove as an orifice. Anus bi-lobed, opening at the level between 11th and 12th stigmatal rows. Stomach with 5–6 plications inclusive of typhlosole (Fig. 2, C), situated in the middle of abdomen. Rectal coecum distinct or obscure. Gonad still immature.

Remarks: The present specimens may be quite unique among a number of species of *Amaroucium* and *Aplidium* from Japan and adjacent waters in combination of the number of stigmatal rows and that of stomach plications. In this feature, the present specimens rather resemble the following species: *Aplidium fuegiense* CUNNINGHAM, 1871 from the circum-subantarctic waters (10–20 stigmatal rows and 4–6 stomach plications: according to KOTT, 1969, pp. 47–50 etc.), *Aplidium globosum* (HERDMAN, 1886) from the Kerguelen and Macquaire Islands (13–15 rows and 4–6 plications: KOTT, 1969, pp. 55–7), *Amaroucium mediterraneum* (HARTMEYER, 1909) from the Mediterranean (14–17 rows and 4–5 plications: PÉRÈS, 1956, p. 294), *Amaroucium notti* BREWIN, 1951 from New Zealand and the Kerguelen Islands (14–16 rows and 4–5 plications: BREWIN, 1951, pp. 105–6; MONNIOT, 1970, pp. 326 and 328), *Aplidium novaezealandiae* BREWIN, 1952 from New Zealand and the Kerguelen Islands (10–15 rows and 4–6 plications: BREWIN, 1952, p. 189; MONNIOT, 1970, pp. 328–9; MONNIOT & GAILL, 1978, p. 147), *Amaroucium ordinatum* (SLUITER, 1906) from western Antarctic (15 rows and 4 plications: VAN NAME, 1945, pp. 46–7), *Aplidium pantherinum* (SLUITER, 1898) from South Africa and South and West Australia (13–16 rows and 4–6 plications: KOTT, 1962, pp. 98–9 and 1972, p. 176; MILLAR, 1968, pp. 9–10), *Amaroucium powelli* BREWIN, 1958 from New Zealand (12 rows and 4 plications: BREWIN, 1958, pp. 455 and 457), *Amaroucium radiatum* (SLUITER, 1906) from western Antarctic (12–14 rows and 4 plications: VAN NAME, 1945, p. 46), *Aplidium undulatum* MONNIOT & GAILL, 1978 (=*Aplidium fuscum* HERDMAN, 1886) from the Kerguelen Islands (12–14 rows and 4–6 plications: KOTT, 1954, pp. 175–6; MONNIOT & GAILL, 1978, pp. 149–151) and *Aplidium vexillum* MONNIOT & GAILL, 1978 from the Kerguelen Islands (13–18 rows and 6 plications: MONNIOT & GAILL, 1978, pp. 151–3). From all these species, however, the present specimens are distinguishable, though unclearly in some cases, mainly by colony structure.

Another massive, roundish and slightly pinkish colony, 70 mm×52 mm in extent and 24 mm in thickness, was dredged off Sakai, Minabe, Wakayama Prefecture, ca. 100 m deep, on March 21, 1975 (Material C). Judging from the concavity on the undersurface, this colony might have covered the carapace of certain crab. Test soft gelatinous, very sparsely impregnated with sand grains; translucent in the surface layer, but quite transparent in deeper layers. Surface smooth, almost without any foreign matters, though marked with irregular shallow furrows, seemingly the branchial aperture of zooids is open there. Some cloacal apertures are discernible on the colony surface, but systems are indistinct. The structure of zooids, though they are rather deteriorated, is quite similar to that of the present new species; atrial languet with simple tip and situated between the dorsal ganglion and the atrial aperture

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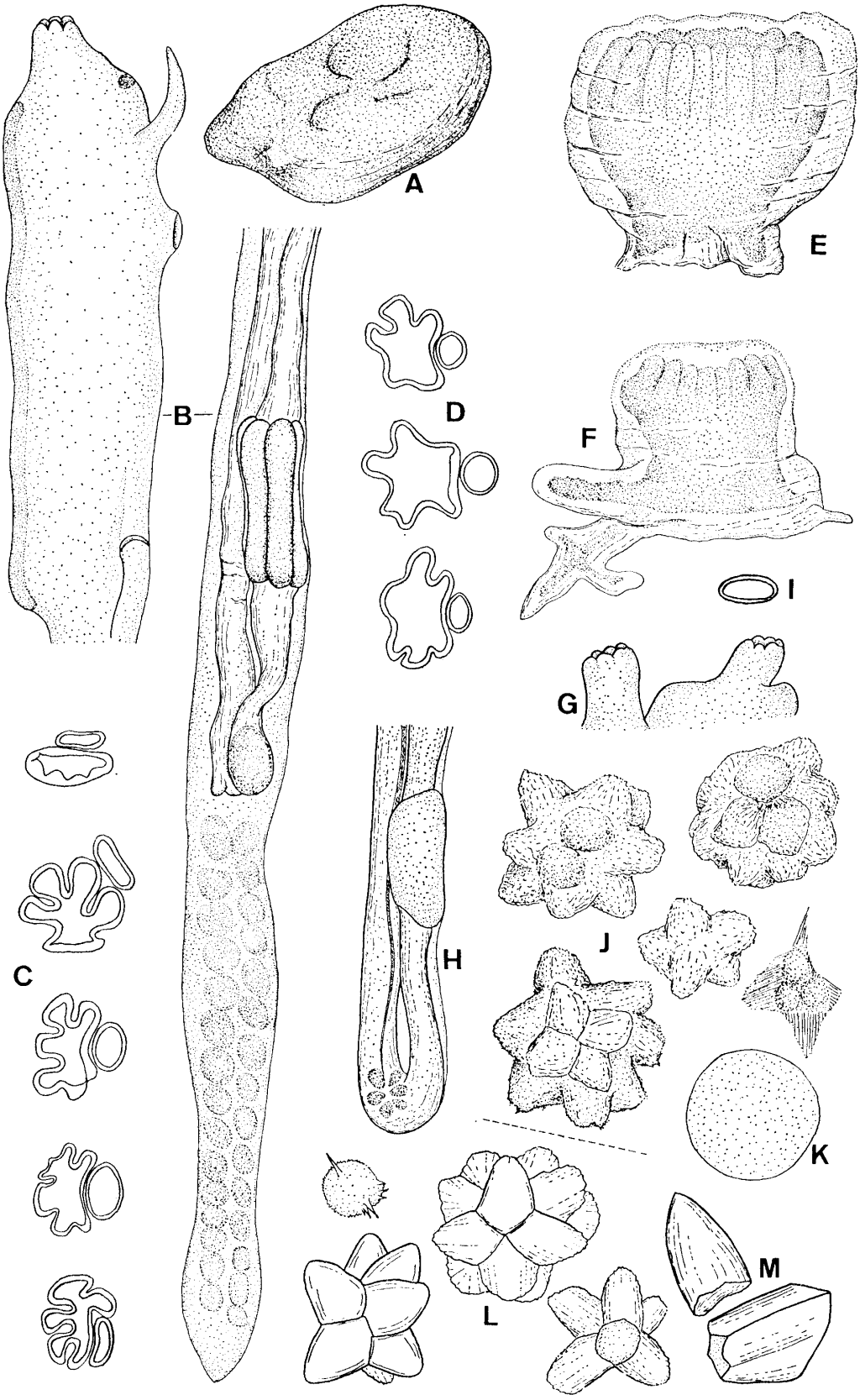

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smoothly edged; ca. 15 longitudinal muscles on each side of thorax; about a dozen of stigmata in each half of 13–14 rows; ca. 20 tentacles; dorsal languets along the left side of the mid-dorsal line; ciliated groove laterally elongated oval; anus bi-lobed at the level of 11th stigmatal row; and stomach with 5–6 plications (Fig. 2, D). Gonad immature. Though the above-mentioned structure of zooids resembles strikingly that of the present new species, the appearance of colony from Minabe seems to differ somewhat from that of the new species. For this reason, the colony from Minabe is recorded here provisionally as *A.* sp. aff. *nadaense.*

Polycitorella setoensis n. sp. (Fig. 2, E–K)

Description: Six small colonies collected by T. YAMAMOTO on the intertidal zone of Shisojima Islet, Tanabe Bay, on May 2, 1961 (Material B). The largest colony designated as holotype (SMBL Type No. 327) is 6.0 mm×11.5 mm in extent and 10 mm high (Fig. 2, E) and contains ca. 30 zooids; the paratype (NSMT-Pc 102) is 5 mm in diameter and 6 mm high (Fig. 2, F) and holds ca. 10 zooids. Colony more or less cylindrical. Test tough, translucent and whitish; spicules are distributed densely and evenly in the abdominal layer and sometimes also in the thoracic layer of colonies. Superficial spiculeless layer thick especially on the lateral side of colony. Two types of spicules are discriminated; one is furnished with a small number of torn or indistinct rays, or nearly spherical, and 12 to 50 μ (25 μ on an average) in diameter (Fig. 2, J), while the other, though found less frequently, is disk-shaped, very thin, with nearly smooth margin, and 10 to 40 μ in diameter (Fig. 2, K). Bladder-cells(?), up to 25 to 30 μ in diameter and containing many small spherules, densely distributed in the test.

Zooids rather deteriorated and contracted. Thorax ca. 1.25 mm and abdomen more than 2 mm in length. Both apetures 6-lobed (Fig. 2, G). More than 20 longitudinal muscles and numerous fine transverse ones on each side of thorax. Twelve to 20 stigmata in each half of 10 to 11 stigmatal rows. Tentacles ca. a dozen. Ciliated groove laterally elongated oval (Fig. 2, I). The abdominal part of zooids only rarely preserved; stomach surface smooth, no rectal coecum, 6 testicular follicles in intestinal loop in an example and sperm duct often full of sperms (Fig. 2, H).

Remarks: Only the following four species are known in the genus *Polycitorella* MICHAELSEN, 1924: *Eucoelium hospitiolum* SAVIGNY, 1816 from the Gulf of Suez (5–6 stigmatal rows; according to SAVIGNY, 1816, pp. 195–7), *P. mariae* MICHAELSEN, 1924 from North Island, New Zealand (12 rows; MICHAELSEN, 1924, pp. 278–285), *P. pallida* MILLAR, 1962 from South Africa (13–15 rows; MILLAR, 1962, pp. 143–5) and *P. mariae*? from Port Phillip Bay, South Australia (7–10 rows; MILLAR, 1963, pp. 711–3). These are all furnished with only stellate (in the first three) or mulberry-shapped (in the last) spicules. By the presence of disk-shaped

Fig. 2. A–C: *Amaroucium nadaense* n. sp. D: *Amaroucium* sp. aff. *nadaense* from Tanabe Bay. A: Holotype colony (SMBL Type No. 326). B: Zooid. C and D: Optical sections of stomach. E–K: *Polycitorella setoensis* n. sp. L–M: *Polycitorella* sp from Gobo. E: Holotype colony (SMBL Type No. 327). F: Paratype colony (NSMT-Pc 102). G: Anterior part of thorax. H: Abdomen. I: Ciliated groove. J and L: Spicules with rays. K: Disk-shaped spicules. M: Crystals.

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spicules and the number of stigmatal rows, the present colonies are easily distinguishable from any already known species.

Other five colonies were collected off Koza in the city of Gobo, Wakayama Prefecture, 4 m deep, on May 3, 1978 (Material E). The maxial colony is 6.5 mm×2.0 mm in extent and 8.5 mm high and contains ca. 10 zooids. Colony more or less cylindrical. Test tough, translucent and whitish. Spicules distributed as in the colonies stated above; furnished with rather distinct rays, 12 to 40 μ, rarely up to 60 μ, in diameter (Fig. 2, L); no disk-shaped ones discernible. Simple probably fragmental crystals, up to 75 μ long, found very rarely in test (Fig. 2, M). Zooids much deteriorated; both apertures 6(?)-lobed and stigmatal rows 10(?). As it is impossible to see precisely the structure on deteriorated zooids, the colonies from Gobo are recorded here provisionally as *Polycitorella* sp.

Notes and Considerations

Taxonomic notes: (1) *Ctenicella undulata* TOKIOKA, 1949 is transferred to the genus *Boltenia* (see Table 1). According to his own explanation of Dr. TOKIOKA, the attribution of this species to *Ctenicella* was brought about by his misunderstanding of the German word "Querreihen" of stigmata. This species is characterized by the renal sac, transverse stigmata, series of dorsal languets and the structure of gonad as in *Cnemidocarpa*. Although the type specimens of this species were unfortunately all lost and therefore it is impossible to examine the true nature of the "renal sac" figured by TOKIOKA (1949a; pl. 6, fig. 7), the species may safely be attributed to *Boltenia*, as its characteristics mentioned above fit rather exactly those of *Boltenia transversaria* (SLUITER, 1904) recorded from Ariake Sea, Japan and also having a "reniform vesicle" (TOKIOKA, 1960, p. 217).

(2) Two types of larva were found in the specimens identified as *Botrylloides violaceus* OKA, 1927: larvae, ca. 750 μ in trunk length and furnished with 20 to 24 ampullae were found in a specimen from Tanabe Bay (collected on May 31, 1976, Material A–2), while larvae, ca. 370 μ in trunk length and furnished with only 8 ampullae were seen in a colony from Tosi-jima Island (Material A–19), though no significant differences were confirmed in the structure of colony or zooid between these specimens. The larvae with many ampullae have been known already in the specimens from Sagami Bay (TOKIOKA, 1953, 20–30 ampullae), Sado, Japan Sea (TOKIOKA, 1962a, up to 30), Anamizu and Maizuru Bays, Japan Sea (NISHIKAWA, unpublished; 30 or more) and from Iwaya, Osaka Bay (do.; 30), while those with 8 ampullae in the specimens from Aburatsubo, Misaki (YAMAGUCHI, 1975). Further closer taxonomical analyses of the specimens of so-called *B. violaceus* are urged.

Brief notes on the ascidian fauna of Kii Peninsula: The localities referred to in this paper are divided into the following five districts: I (Kada to Minoshima), II (Mio to Susami), III (Kushimoto to Taiji), IV (Nigijima) and V (Nanto-cho to Toshi-jima Island) as shown in Fig. 1 and Table 1. On the other hand, the distributions of respective species are geographically grouped as follows as ever attempted by TOKIOKA (1963, p. 143):

a: North temperate-water species distributed widely in the waters surrounding four main islands of Japan.

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a_1: Distribution limited endemically to Japanese and her adjacent waters.
a_2: Distribution extended northerly.
a_3: Distribution extended southerly.
b: Tropical-water species distributed in the waters south of the middle part of Honsyu Island.
b_1: Distribution limited endemically to Japanese and her adjacent waters.
b_2: Distribution extended southerly.
c: Cosmopolitan species.

The data given on Table 1 may be summarized as follows:

1. The species recorded from the Kii Peninsula attain to nearly one-third of all those from Japanese and her adjacent waters (cf. TOKIOKA, 1963). As far as the clearly identified species are concerned, the ascidian fauna of the Kii Peninsula consists of 24 (23%) "north temperate-water species" inclusive of the boreal species such as *Eugyrioides glutinans* (MÖLLER), 79 (76%) "tropical-water species" and 1(1%) cosmopolitan species.
2. The richness of recorded species in respective districts may depend largely on the collection efforts including the number of stations, methods and so on at least at the present level of surveys. However, the complete absence of *Corella japonica* HERDMAN, *Rhodosoma turcicum* (SAVIGNY) and *Styela clava* HERDMAN in the district II studied rather extensively might be of some geographical significance.

Further, the author's own experience, together with the data on Table 1, seems to suggest that *Didemnum* (*D.*) *moseleyi* (HERDMAN) and *Cnemidocarpa areolata* (HELLER) are common inhabitants in the inter- to subtidal zones, and *Polycarpa cryptocarpa* var. *kuroboja* (OKA) is rather abundunt in the subtidal zone throughout the whole coast of the penunsula.

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要　　約

今までの記録に今回の調査結果を加えて紀伊半島沿岸産ホヤ類のリストを作成した（表1）．これによると，この地域には日本近海から知られている種の約1/3が分布し，その7割以上がいわゆる熱帯性の種であることがわかる．このうち *Amaroucium nadaense* と *Polycitorella setoensis* は，新種としてここに記載した．

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